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ABSTRACT

This learning activity packet (LAP) is one of three that accompany the curriculum guide on grinding machines. It outlines the study activities and performance tasks for the second unit of this curriculum guide. Its purpose is to aid the student in attaining a working knowledge of this area of training and in achieving a skilled or moderately skilled competency level in the performance of jobs associated with this specialty. The course of study in this LAP will help the student become able to set up and operate a surface grinder, select proper composition and shape of grinding wheels, dress grinding wheels, perform flat and angular grinding operations, and be able to use various work-holding and mounting devices. Ten tasks are included in the LAP. Contents are a check list of the learning steps, pretest, assignment sheets, and answer keys for the pretest and assignment sheets. (YLB)

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State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for GRINDING MACHINES

LAP NO. _____ CODE: _____

INSTRUCTIONAL UNIT II--SURFACE GRINDING

LEARNING ACTIVITY PACKET NO. 2

PREREQUISITE LAP(S) 1

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities and performance tasks for "Surface Grinding." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a Skilled or Moderately Skilled competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to set up and operate a surface grinder, select proper composition and shape of grinding wheels, dress grinding wheels, perform flat and angular grinding operations and be able to use various work-holding and mounting devices.

TASKS INCLUDED IN THIS LAP:

1. Remove and replace a grinding wheel.
2. Dress a wheel flat.
3. Grind a workpiece flat and parallel.
4. Grind a workpiece square.
5. Grind an angular surface.
6. Grind an angular surface using connetic V-block.
7. Grind a vertical surface.
8. Grind a workpiece to dimension.
9. Dress a grinding wheel to a 90-degree included angle.
10. Dress a grinding wheel having a 1/8-inch radius and 30- and 40-degree angles tangent to radius.

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User of LAP:

Included in this LAP are the answers to the pre-test and answers to the assignment sheets. If you desire to evaluate these two components, then it will be your responsibility to remove these components from the LAP prior to giving to the student. If you desire for the student to assume the responsibility for self-evaluation, then we would suggest that you leave the components contained as part of the LAP.

We hope this developmental design proves to be beneficial to you.

Sincerely,

Bob Patton, Coordinator
Curriculum and Instructional
Materials Center

BP:jd

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82-000704

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LEARNING STEPS

Check the following blanks as you complete the required steps.

____ 1.	Read	Unit and Specific Objectives, page GM-105.
____ 2.	Complete	Surface Grinding Pretest, LAP page 15.
____ 3.	Study	The sections of the Information Sheet, pages GM-109 through GM-129, indicated by your instructor on your pretest.
____ 4.	Refer	To Step 10 of the pretest. If additional study is indicated for any of the Information Sheet, Sections I, V, VII, VIII, or IX, continue to Learning Step 5. Otherwise, proceed to Learning Step 7.
____ 5.	Do	LAP Assignment Sheet #1, LAP page 29.
____ 6.	Do	LAP Assignment Sheet #2, LAP page 35.
____ 7.	Refer	To Step 10 of the pretest. If additional study is indicated for the Information Sheet, Section VI, continue to Learning Step 8. Otherwise, proceed to Learning Step 11.
____ 8.	Do	Assignment Sheet #1--Identify Correct Work-Holding Devices for Surface Grinding Operations, pages GM-133 through GM-139.

_____ 9.	Stop.	Have your instructor evaluate Assignment Sheet #1. If your instructor is satisfied with your performance, proceed to Learning Step 11. Otherwise, continue to Learning Step 10.
_____10.	Do	LAP Assignment Sheet #3, LAP page 43.
_____11.	Refer	To Step 10 of the pretest. If additional study is indicated for any of Information Sheet, Sections II, III, or IV, continue to Learning Step 12. Otherwise, proceed to Learning Step 24.
_____12.	Do	Assignment Sheet #2--Plan Procedures to Grind Parallels, pages GM-141 through GM-143.
_____13.	Stop.	Have your instructor evaluate Assignment Sheet #2. If your instructor is satisfied with your performance, proceed to Learning Step 15. Otherwise, continue to Learning Step 14.
_____14.	Do	LAP Assignment Sheet #4, LAP page 47.
_____15.	Do	Assignment Sheet #3--Plan Procedures to Grind a Set of Setup Blocks, pages GM-145 through GM-147.
_____16.	Stop.	Have your instructor evaluate Assignment Sheet #3. If your instructor is satisfied with your performance, proceed to Learning Step 18. Otherwise, continue to Learning Step 17.
_____17.	Do	LAP Assignment Sheet #5, LAP page 51.

_____18.	Do	Assignment Sheet #4--Plan Procedures to Grind a Step Angle Plate, pages GM-149 through GM-151.
_____19.	Stop.	Have your instructor evaluate Assignment Sheet #4. If your instructor is satisfied with your performance, proceed to Learning Step 21. Otherwise, continue to Learning Step 20.
_____20.	Do	LAP Assignment Sheet #6, LAP page 53.
_____21.	Do	Assignment Sheet #5--Plan Procedures to Grind a V-Block, pages GM-153 through GM-155.
_____22.	Stop.	Have your instructor evaluate Assignment Sheet #5. If your instructor is satisfied with your performance, proceed to Learning Step 24. Otherwise, continue to Learning Step 23.
_____23.	Do	LAP Assignment Sheet #7, LAP page 55.
_____24.	Check	The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date: Skilled	Moderately Skilled
_____a.	Remove and replace a grinding wheel (27).	_____	_____
_____b.	Dress a wheel flat (33).	_____	_____
_____c.	Grind a workpiece flat and parallel (39).	_____	_____
_____d.	Grind a workpiece square (45).	_____	_____

Student Check		Instructor Initials/Date: Skilled	Moderately Skilled
_____e.	Grind an angular surface (51).	_____	_____
_____f.	Grind an angular surface using connetic V-block (57).	_____	_____
_____g.	Grind a vertical surface (63).	_____	_____
_____h.	Grind a workpiece to dimension (69).	_____	_____
_____i.	Dress a grinding wheel to a 90-degree included angle (75).	_____	_____
_____j.	Dress a grinding wheel having a 1/8-inch radius and 30- and 40-degree angles tangent to radius (81).	_____	_____

_____25. Discuss — Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Learning Step 86. Otherwise, continue to Learning Step 26.

_____26. Refer — To Learning Step 24a. If this task has been initialed by your instructor, proceed to Learning Step 32. Otherwise, continue to Learning Step 27.

_____27. Study — Job Sheet #1--Remove and Replace a Grinding Wheel, pages GM-165 through GM-169.

_____28. Watch — Slide/tape presentation "Remove and Replace a Grinding Wheel" (GM-II-1).

_____29. Do — Job Sheet #1--Remove and Replace a Grinding Wheel.

_____30.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24a and proceed to Learning Step 32. Otherwise, repeat Learning Steps 27 through 29 and then continue to Learning Step 31.
_____31.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24a and continue to Learning Step 32. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24a and then continue to Learning Step 32.
_____32.	Refer	To Learning Step 24b. If this task has been initialed by your instructor, proceed to Learning Step 38. Otherwise, continue to Learning Step 33.
_____33.	Study	Job Sheet #2--Dress a Wheel Flat, pages GM-171 through GM-173.
_____34.	Watch	Slide/tape presentation "Dress a Wheel Flat" (GM-II-2).
_____35.	Do	Job Sheet #2--Dress a Wheel Flat.
_____36.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24b and proceed to Learning Step 38. Otherwise, repeat Learning Steps 33 through 35 and then continue to Learning Step 37.

_____37. Stop. Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24b and continue to Learning Step 38. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24b and then continue to Learning Step 38.

_____38. Refer To Learning Step 24c. If this task has been initialed by your instructor, proceed to Learning Step 44. Otherwise, continue to Learning Step 39.

_____39. Study Job Sheet #3--Grind a Workpiece Flat and Parallel, pages GM-175 through 178.

_____40. Watch Slide/tape presentation "Grind a Workpiece Flat and Parallel" (GM-II-3).

_____41. Do Job Sheet #3--Grind a Workpiece Flat and Parallel.

_____42. Stop. Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24c and proceed to Learning Step 44. Otherwise, repeat Learning Steps 39 through 41 and then continue to Learning Step 43.

_____43. Stop. Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24c and continue to Learning Step 43. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24c and then continue to Learning Step 44.

_____44. Refer To Learning Step 24d. If this task has been initialed by your instructor, proceed to Learning Step 50. Otherwise, continue to Learning Step 45.

____45.	Study	Job Sheet #4--Grind a Workpiece Square, pages GM-179 through GM-183.
____46.	Watch	Slide/tape presentation "Grind a Workpiece Square" (GM-II-4).
____47.	Do	Job Sheet #4--Grind a Workpiece Square.
____48.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24d and proceed to Learning Step 50. Otherwise, repeat Learning Steps 45 through 47 and then continue to Learning Step 49.
____49.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24d and continue to Learning Step 50. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24d and then continue to Learning Step 50.
____50.	Refer	To Learning Step 24e. If this task has been initialed by your instructor, proceed to Learning Step 56. Otherwise, continue to Learning Step 51.
____51.	Study	Job Sheet #5--Grind an Angular Surface, pages GM-185 through 190.
____52.	Watch	Slide/tape presentation "Grind an Angular Surface" (GM-II-5).

_____53.	Do	Job Sheet #5--Grind an Angular Surface.
_____54.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24e and proceed to Learning Step 56. Otherwise, repeat Learning Steps 51 through 53 and then continue to Learning Step 55.
_____55.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24e and continue to Learning Step 56. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24e and then continue to Learning Step 56.
_____56.	Refer	To Learning Step 24f. If this task has been initialed by your instructor, proceed to Learning Step 62. Otherwise, continue to Learning Step 57.
_____57.	Study	Job Sheet #6--Grind an Angular Surface Using Connetic V-Block, pages GM-191 through 196.
_____58.	Watch	Slide/tape presentation "Grind an Angular Surface Using Connetic V-Block" (GM-II-6).
_____59.	Do	Job Sheet #6--Grind an Angular Surface Using Connetic V-Block.
_____60.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24f and proceed to Learning Step 62. Otherwise, repeat Learning Steps 57 through 59 and then continue to Learning Step 61.

____61.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24f and continue to Learning Step 62. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24f and then continue to Learning Step 62.
____62.	Refer	To Learning Step 24g. If this task has been initialed by your instructor, proceed to Learning Step 68. Otherwise, continue to Learning Step 63.
____63.	Study	Job Sheet #7--Grind a Vertical Surface, pages GM-197 through GM-201.
____64.	Watch	Slide/tape presentation "Grind a Vertical Surface" (GM-II-7).
____65.	Do	Job Sheet #7--Grind a Vertical Surface.
____66.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24g and proceed to Learning Step 68. Otherwise, repeat Learning Steps 63 through 65 and then continue to Learning Step 67.
____67.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24g and continue to Learning Step 68. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24g and then continue to Learning Step 68.

____68.	Refer	To Learning Step 24h. If this task has been initialed by your instructor, proceed to Learning Step 74. Otherwise, continue to Learning Step 69.
____69.	Study	Job Sheet #8--Grind a Workpiece to Dimension, pages GM-203 through GM-207.
____70.	Watch	Slide/tape presentation "Grind a Workpiece to Dimension" (GM-II-8).
____71.	Do	Job Sheet #8--Grind a Workpiece to Dimension.
____72.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24h and proceed to Learning Step 74. Otherwise, repeat Learning Steps 69 through 71 and then continue to Learning Step 73.
____73.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24h and continue to Learning Step 74. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24h and then continue to Learning Step 74.
____74.	Refer	To Learning Step 24i. If this task has been initialed by your instructor, proceed to Learning Step 80. Otherwise, continue to Learning Step 75.
____75.	Study	Job Sheet #9--Dress a Grinding Wheel to a 90-Degree Included Angle, pages GM-209 through 214.

_____76.	Watch	Slide/tape presentation "Dress a Grinding Wheel to a 90-Degree Included Angle" (GM-II-9).
_____77.	Do	Job Sheet #9--Dress a Grinding Wheel to a 90-Degree Included Angle.
_____78.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24i and proceed to Learning Step 80. Otherwise, repeat Learning Steps 75 through 77 and then continue to Learning Step 79.
_____79.	Stop.	Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24i and continue to Learning Step 80. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24i and then continue to Learning Step 80.
_____80.	Refer	To Learning Step 24j. If this task has been initialed by your instructor, proceed to Learning Step 86. Otherwise, continue to Learning Step 81.
_____81.	Study	Job Sheet #10--Dress a Grinding Wheel Having a 1/8-Inch Radius and 30- and 40-Degree Angles Tangent to Radius, pages GM-215 through GM-217.
_____82.	Watch	Slide/tape presentation "Dress a Grinding Wheel Having a 1/8-Inch Radius and 30- and 40-Degree Angles Tangent to Radius" (GM-II-10).
_____83.	Do	Job Sheet #10--Dress a Grinding Wheel Having a 1/8-Inch Radius and 30- and 40-Degree Angles Tangent to Radius.

_____84. Stop. Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24j and proceed to Learning Step 86. Otherwise, repeat Learning Steps 81 through 83 and then continue to Learning Step 85.

_____85. Stop. Have your instructor evaluate your work. If you achieve a Skilled or Moderately Skilled rating, have your instructor initial Learning Step 24j and continue to Learning Step 86. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Learning Step 24j and then continue to Learning Step 86.

_____86. Refer To Learning Step 24. If all of the tasks have been initialed by your instructor, continue to Learning Step 87. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____87. Review Information Sheet (pages GM-109 through GM-129).

_____88. Take Surface Grinding Test (see your instructor). If your score is 85 percent or above, continue to the next assigned Learning Activity Packet. Otherwise, ask your instructor about additional study requirements and possible retesting.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

PRETEST

NAME_____ SCORE_____

DIRECTIONS: This pretest is to determine how much you already know about surface grinding. Your performance on this pretest will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. If you are unsure of the answer to a question, do not guess. Guessing may prevent you from receiving needed instruction.

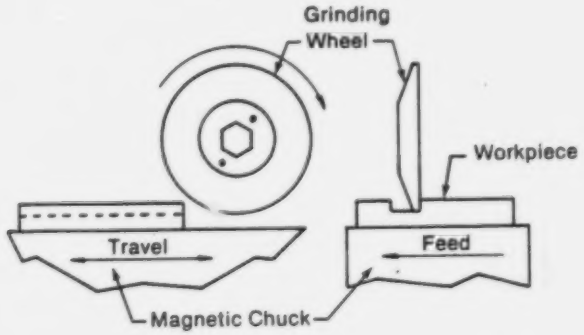
1. Match terms associated with surface grinding to their correct definitions. Write the correct numbers in the blanks.

_____a.	Carbon and other impurities on the surface of steel that has been heat-treated or hot-rolled	1. Surface finish
_____b.	Internal strain in workpiece produced by manufacturing, machining, or heat-treating	2. Energize
_____c.	Outward-curving surface	3. Scale
_____d.	Moving alternately back and forth	4. Fishtails
_____e.	Movement of grinding wheel from back to front during grinding operation	5. Stress
_____f.	Inward-curving surface	6. Stone the chuck
_____g.	Degree of difficulty involved in grinding a material	7. Traverse
_____h.	Horizontal movement of the table right and left	8. Flat
_____i.	To apply power to a magnetic device	9. Reciprocating
_____j.	Random scratches on a workpiece surface	10. Grindability
_____k.	To remove burrs by rubbing surface of magnetic chuck with hard oilstone	11. Concave
_____l.	Appearance or degree of smoothness of workpiece	12. Across
_____m.	Surface that is straight and free of warps or bows	13. Dress
		14. Convex

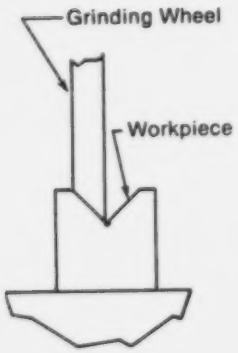
_____n. To shape grinding wheel flat, or to a specific form, and to expose new, sharp cutting particles

2. Identify surface grinding operations. Write the correct grinding operations in the blanks. Some blanks may contain more than one answer. Some answers may be used more than once.

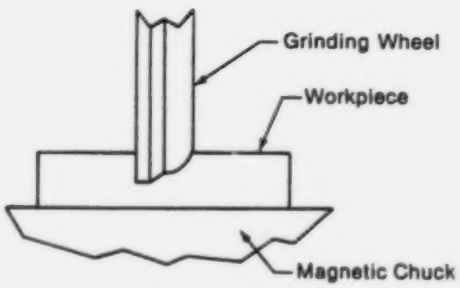
Grinding grooves or slots	Grinding vertical surfaces
Cutting off	Grinding edges
Grinding angular surfaces	Grinding flat surfaces
Form or profile grinding	



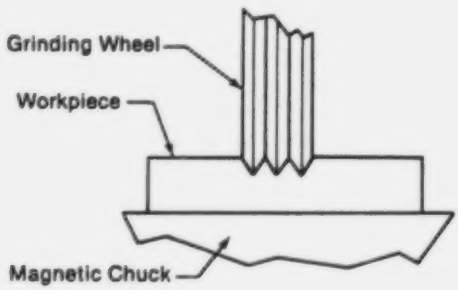
a. _____



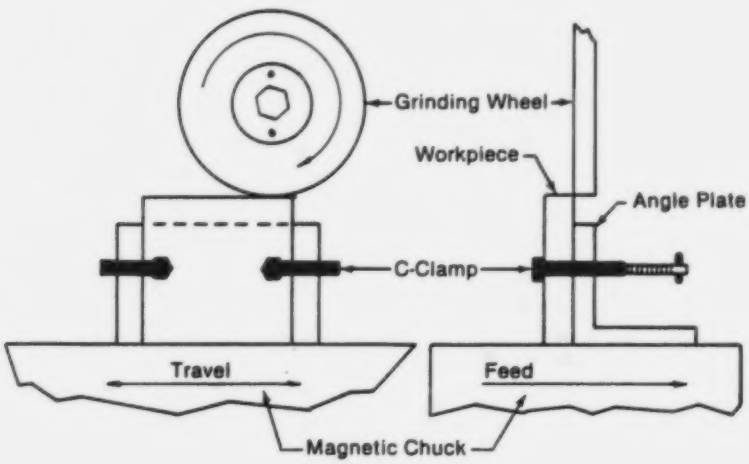
b. _____


Grinding Wheel
Workpiece
Magnetic Chuck

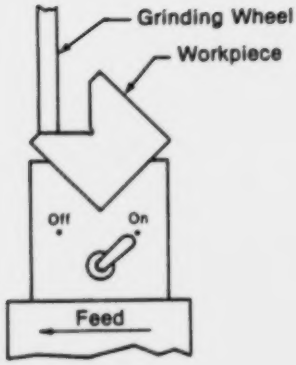
c. _____


Grinding Wheel
Workpiece
Magnetic Chuck

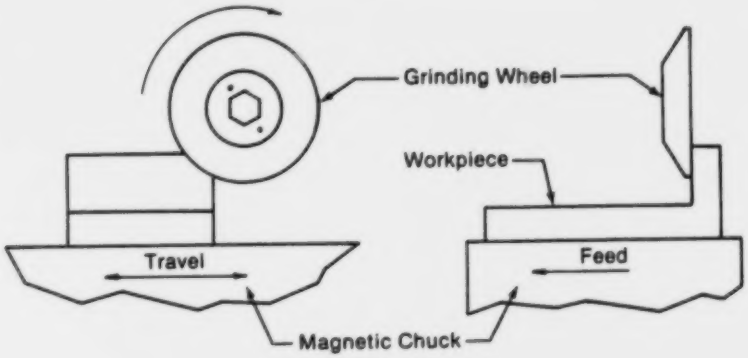
d. _____


Grinding Wheel
Workpiece
Angle Plate
C-Clamp
Travel
Feed
Magnetic Chuck

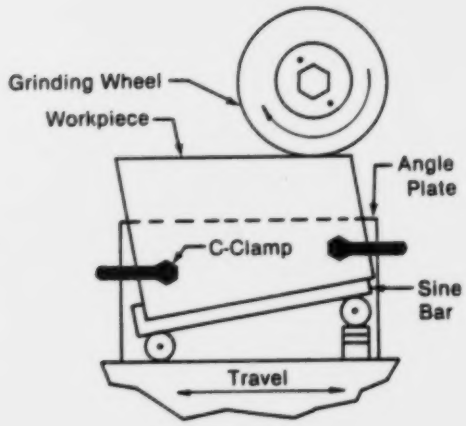
e. _____


Grinding Wheel
Workpiece
Off
On
Feed

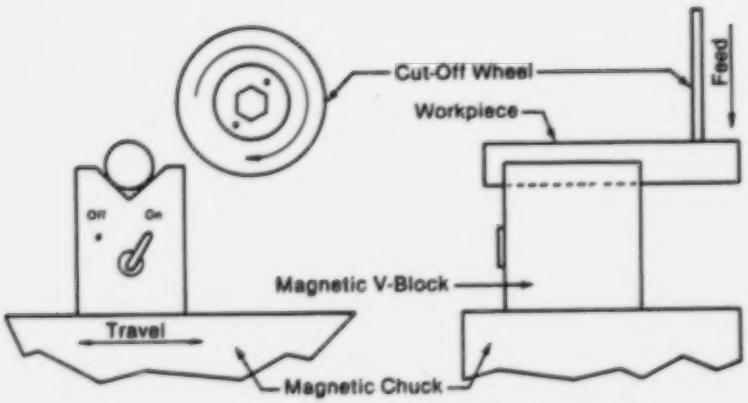
f. _____


Grinding Wheel
Workpiece
Travel
Feed
Magnetic Chuck

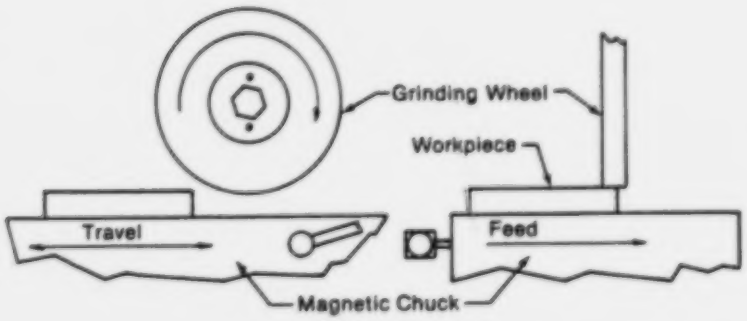
g. _____


Grinding Wheel
Workpiece
Angle Plate
C-Clamp
Sine Bar
Travel

h. _____


Cut-Off Wheel
Workpiece
Feed
Off
On
Magnetic V-Block
Travel
Magnetic Chuck

i. _____


Grinding Wheel
Workpiece
Travel
Feed
Magnetic Chuck

j. _____

3. Identify types of grinding wheels used for specific surface grinding operations. Write the correct type number(s) in the blanks. Some blanks may contain more than one answer. Some answers may be used more than once.

_____a.	Form grinding	Type #1 (straight wheel)
_____b.	Grinding grooves or slots	Type #5 (recessed one side)
_____c.	Grinding angular surfaces	Type #12 (dish)
_____d.	Grinding edges	
_____e.	Grinding flat surfaces	
_____f.	Grinding vertical surfaces	

4. Select the proper grinding-wheel composition for different materials. Write the correct numbers in the blanks. Some blanks may contain more than one answer. Some answers may be used more than once.

_____a.	Soft steel	1. Aluminum oxide with vitrified bond
_____b.	Carbide	2. Cubic boron nitride with resinoid bond
_____c.	Hardened steel	
_____d.	Cast iron (soft), bronze, and aluminum	3. Diamond with metal bond
_____e.	High speed steel	4. Silicon carbide with vitrified bond

5. Match types of grinding-wheel dressers to their correct functions/ descriptions. Write the correct numbers in the blanks.

_____a.	Hand-held dresser used to remove ragged edges from grinding wheel; also used for rough forming or shaping	1. Radius dresser
_____b.	Form dresses wheel by using a diamond to generate angles, radii, or a combination of an angle and radius	2. Brake-controlled dressing and truing device
_____c.	Form dresses wheel by using a diamond to generate a set radius for a concave or convex surface	3. Radius and tangent dresser
_____d.	Mounted dresser used to dress and true grinding wheel; can be used to true diamond wheels when used with proper dressing stone	4. Dressing stick

_____e. Form dresses wheel by using a mechanical finger that follows a template and generates shape of template

_____f. Mounts to magnetic chuck; is adjusted to desired angle; dressing of wheel may be done mechanically or by hand using a diamond mounted in holder

_____g. Holder is mounted directly to magnetic chuck; dresses periphery of grinding wheel flat

_____h. Primarily used for form or contour dressing; shape of plate dresses grinding wheel; dressers of this type are usually mounted so that dressing can occur during grinding operation

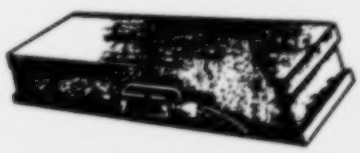
_____i. Mounted to chuck or table; used to rough dress grinding wheels concentric to spindle prior to flat dressing

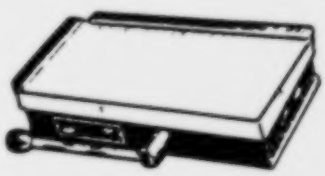
_____j. Permanently mounted to wheel guard; dresses periphery of grinding wheel flat

5. Single-point mounted diamond held in overhead-type dresser
6. Pantograph or template-type dresser
7. Single-point mounted diamond held in holder
8. Roll dresser
9. Sine dresser (angle dresser)
10. Diamond-plate dressing block

6. Identify the work-holding devices illustrated. Write the correct names in the blanks.

Adjustable angle plate
Adapter plate
Indexing collet fixture
Connetic parallels
Magnetic V-block
Angle plate
V-block and clamp
Magnetic chucks
Collet block chucks
Magna-vise clamps
Sine vise
Vacuum chuck
Compound sine chuck
Vise (precision)
Connetic V-block





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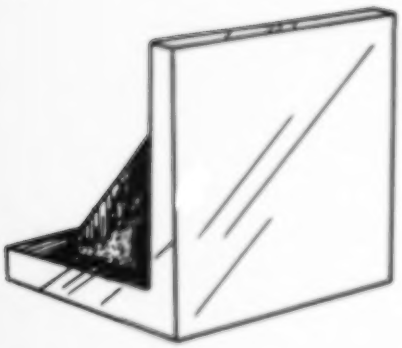

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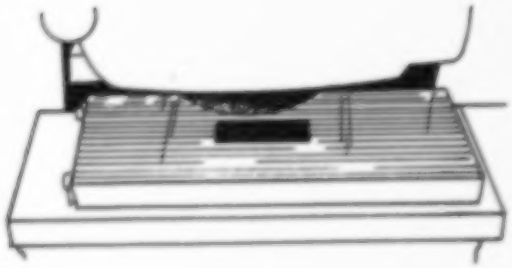

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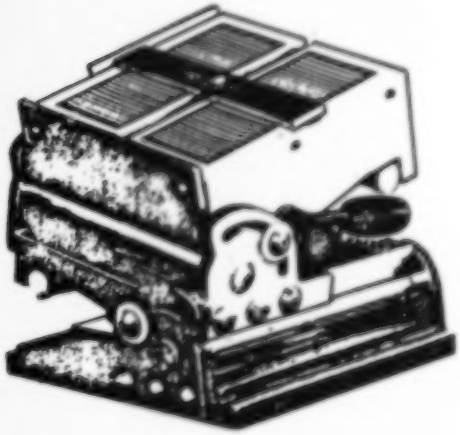

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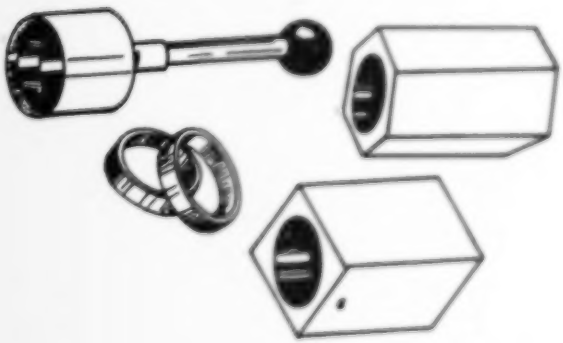

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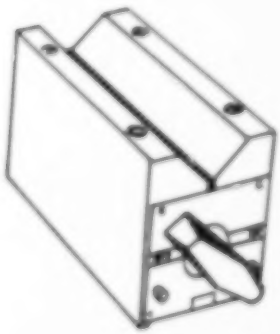

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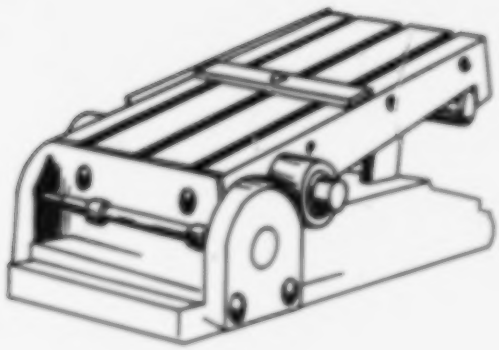

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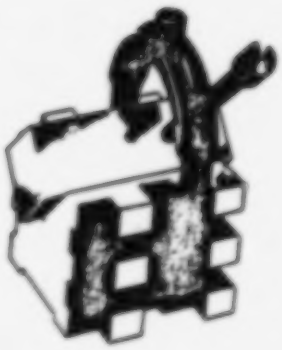

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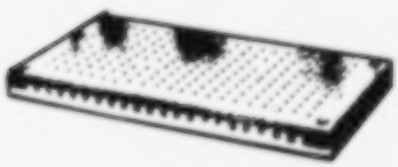

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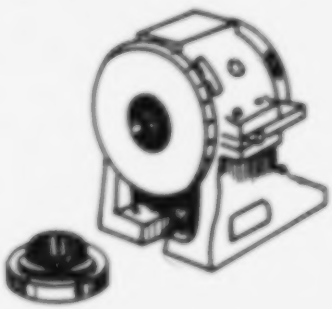

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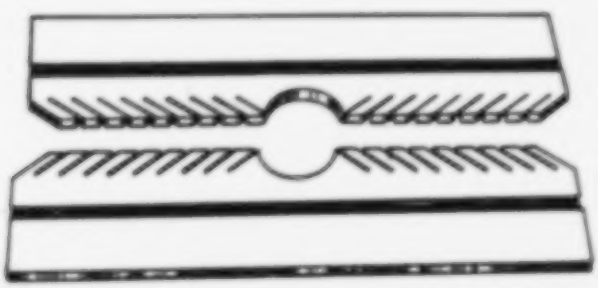

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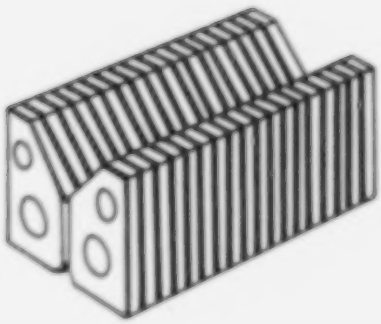

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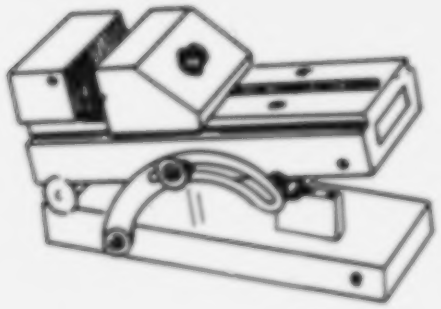

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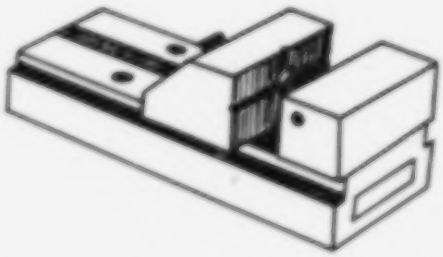


o. _____

7. Match the parts of a radius and tangent dresser to their correct uses. Write the correct numbers in the blanks.

_____a.	Supports swivel base; allows horizontal movement of swivel base	1. Gib tension screws
_____b.	Cuts wheel to shape	2. Swivel ring
_____c.	Supports diamond and micrometer plate	3. Swivel-ring stop pins
_____d.	Used with swivel ring to set amount of radius	4. Micrometer pins
_____e.	Supports swivel-base slide and upright	5. Base
_____f.	Calibrates diamond to swivel base	6. Swivel-base slide
_____g.	Set radius limits	7. Swivel base
		8. Traverse lock
		9. Fixed stop

_____h. Moves diamond in a straight line at angle desired

_____i. Moves swivel-base slide with micrometer accuracy; calibrated in 0.001-inch increments

_____j. Prevents movement of angle traverse control handle

_____k. Stops rotation of upright by making contact with swivel-ring stop pins

_____l. Stop swivel-base and ring rotation at setting of fixed stop

_____m. Indicates amount of movement of swivel ring

_____n. Locks slide in place at setting of micrometer pins

_____o. Allows swivel ring to be set to generate a radius up to 180 degrees

_____p. Lock swivel-base slide in base

_____q. Rotates on swivel base to set amount of radius

10. Vernier plate
11. Slide lock
12. Upright
13. Diamond
14. Micrometer plate
15. Angle traverse control handle
16. Swivel-ring locking screw
17. Micrometer base lead-screw knob

8. List probable causes of surface grinding problems.

BURNING OR CHECKING (List four causes.)

a. _____

b. _____

c. _____

d. _____

CHATTER (List four causes.)

a. _____

b. _____

c. _____

d. _____

SCRATCHES (List four causes.)

a. _____

b. _____

c. _____

d. _____

CONCAVE OR CONVEX AREAS ON WORKPIECE (List four causes.)

a. _____

b. _____

c. _____

d. _____

9. State safety rules that apply to magnetic chuck work.

a. _____

_____

b. _____

_____

c. _____

_____

d. _____

_____

e. _____

_____

f. _____

_____

g. _____

_____

h. _____

_____

i. _____

_____

j. _____

_____

k. _____

_____

l. _____

_____

m. _____

_____

10. Stop. Have your instructor evaluate your pretest and mark the area(s) below requiring additional study.

Refer to Information Sheet, Section(s)

____I	____IV	____VII
____II	____V	____VIII
____III	____VI	____IX

You came here from Learning Step 2. If none of the above sections are checked, proceed to Learning Step 24. Otherwise, continue to Learning Step 3.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #1

NAME_____ SCORE_____

1. Match terms associated with surface grinding to their correct definitions. Write the correct numbers in the blanks.

_____a.	Degree of difficulty involved in grinding a material	1. Grindability
_____b.	Horizontal movement of the table right and left	2. Concave
_____c.	To apply power to a magnetic device	3. Across
_____d.	Random scratches on a workpiece surface	4. Dress
_____e.	To remove burrs by rubbing surface of magnetic chuck with hard oilstone	5. Convex
_____f.	Appearance or degree of smoothness of workpiece	6. Stone the chuck
_____g.	Surface that is straight and free of warps or bows	7. Energize
_____h.	To shape grinding wheel flat, or to a specific form, and to expose new, sharp cutting particles	8. Surface finish
_____i.	Carbon and other impurities on the surface of steel that has been heat-treated or hot-rolled	9. Flat
_____j.	Internal strain in workpiece produced by manufacturing, machining, or heat-treating	10. Scale
_____k.	Outward-curving surface	11. Fishtails
_____l.	Moving alternately back and forth	12. Reciprocating
_____m.	Movement of grinding wheel from back to front during grinding operation	13. Stress
_____n.	Inward-curving surface	14. Traverse

2. Match types of grinding wheel dressers to their correct functions/ descriptions. Write the correct numbers in the blanks.

_____a. Mounted dresser used to dress and true grinding wheel; can be used to true diamond wheels when used with proper dressing stone	1. Brake-controlled dressing and truing device
_____b. Form dresses wheel by using a diamond to generate angles, radii, or a combination of an angle and radius	2. Diamond-plate dressing block
_____c. Mounted to chuck or table; used to rough dress grinding wheels concentric to spindle prior to flat dressing	3. Sine dresser (angle dresser)
_____d. Hand-held dresser used to remove ragged edges from grinding wheel; also used for rough forming or shaping	4. Radius dresser
_____e. Mounts to magnetic chuck; is adjusted to desired angle; dressing of wheel may be done mechanically or by hand using a diamond mounted in holder	5. Radius and tangent dresser
_____f. Primarily used for form or contour dressing; shape of plate dresses grinding wheel; dressers of this type are usually mounted so that dressing can occur during grinding operation	6. Pantograph or template-type dresser
_____g. Form dresses wheel by using a diamond to generate a set radius for a concave or convex surface	7. Roll dresser
_____h. Holder is mounted directly to magnetic chuck; dresses periphery of grinding wheel flat	8. Single-point mounted diamond held in holder
_____i. Form dresses wheel by using a mechanical finger that follows a template and generates shape of template	9. Single-point mounted diamond held in overhead-type dresser
_____j. Permanently mounted to wheel guard; dresses periphery of grinding wheel flat	10. Dressing stick

3. Match the parts of a radius and tangent dresser to their correct uses. Write the correct numbers in the blanks.

_____a.	Supports swivel base; allows horizontal movement of swivel base	1.	Swivel ring
_____b.	Cuts wheel to shape	2.	Gib tension screws
_____c.	Allows swivel ring to be set to generate a radius up to 180 degrees	3.	Base
_____d.	Lock swivel-base slide in base	4.	Upright
_____e.	Rotates on swivel base to set amount of radius	5.	Diamond
_____f.	Moves swivel-base slide with micrometer accuracy; calibrated in 0.001-inch increments	6.	Swivel-base slide
_____g.	Prevents movement of angle traverse control handle	7.	Vernier plate
_____h.	Stops rotation of upright by making contact with swivel-ring stop pins	8.	Micrometer plate
_____i.	Stop swivel-base and ring rotation at setting of fixed stop	9.	Micrometer base lead-screw knob
_____j.	Indicates amount of movement of swivel ring	10.	Fixed stop
_____k.	Locks slide in place at setting of micrometer pins	11.	Micrometer pins
_____l.	Calibrates diamond to swivel base	12.	Traverse lock
_____m.	Set radius limits	13.	Swivel-ring locking screw
_____n.	Moves diamond in a straight line at angle desired	14.	Slide lock
_____o.	Supports diamond and micrometer plate	15.	Angle traverse control handle
_____p.	Used with swivel ring to set amount of radius	16.	Swivel-ring stop pins
_____q.	Supports swivel-base slide and upright	17.	Swivel base

4. Check the boxes under the problems which may result from the causes listed.

CAUSE	PROBLEM			
	Chatter	Burning or Checking	Scratches	Concave or Convex Areas on Workpiece
a. Excessive feed				
b. Excessive depth of cut				
c. Internal machine vibrations				
d. Spindle bearings bad				
e. Heat-treatment stress				
f. Wheel not dressed or improperly dressed				
g. Wheel out of round				
h. Wheel out of balance				
i. Wheel too coarse				
j. Wheel too fine				
k. Wheel too soft				
l. Wheel too hard				
m. Loose dirt under guard				
n. Workpiece not held securely				
o. Workpiece too thin				
p. External machine vibrations				
q. Coolant dirty				
r. Coolant applied improperly				
s. Table feed too slow				
t. Chuck dirty or burred				

5. Write the safety rules for working with a magnetic chuck.

a. Cleaning--_____

_____

b. Deburring--_____

_____

c. Workpiece--_____

_____

d. Paper--_____

_____

e. Magnetized strips--_____

_____

f. Small parts--_____

_____

g. Jewelry--_____

_____

h. Setup--_____

_____

i. Eyes--_____

_____

j. Connetic V-blocks and parallels--_____

_____

_____

k. Magna-vise clamps--_____

_____

l. Side and end plates--_____

_____

m. Resurfacing--_____

_____

6. Stop. Have your instructor evaluate your Assignment Sheet and mark the area(s) below requiring additional study.

Refer to Information Sheet, Section(s)

_____I _____V _____VII _____VIII _____IX

If none of the above sections are checked, proceed to Learning Step 7. Otherwise, study the required sections of the Information Sheet and then go to Learning Step 6.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #2

NAME_____ SCORE_____

1. Fill in the blanks to complete terms and definitions associated with surface grinding.

Difficulty	Power
Inward	Burrs
Alternately	Outward
Horizontal	Smoothness
Impurities	Back to front
Shape	Scratches
Warps or bows	Cutting particles
Strain	

a. CONCAVE--_____-curving surface

b. ACROSS--Movement of grinding wheel from _____ _____ during grinding operation

c. ENERGIZE--To apply _____ to a magnetic device

d. GRINDABILITY--Degree of _____ involved in grinding a material

e. TRAVERSE--_____ movement of the table right and left

f. RECIPROCATING--Moving _____ back and forth

g. SURFACE FINISH--Appearance or degree of _____ of workpiece

h. CONVEX--_____-curving surface

i. STONE THE CHUCK--To remove _____ by rubbing surface of magnetic chuck with hard oilstone

j. SCALE--Carbon and other _____ on the surface of steel that has been heat-treated or hot-rolled

k. FISHTAILS--Random _____ on workpiece surface

LAP ASSIGNMENT SHEET #2

1. STRESS--Internal _____ in workpiece produced by manufacturing, machining, or heat-treating

m. FLAT--Surface that is straight and free of _____ _____

n. DRESS--To _____ grinding wheel flat, or to a specific form, and to expose new, sharp _____ _____

2. Answer the following questions about grinding-wheel dressers.

a. When using a single-point mounted diamond held in holder, where is the holder mounted? _____

b. The single-point mounted diamond held in holder dresses the wheel to what shape? _____

c. When using a single-point mounted diamond held in overhead-type dresser, where is the diamond mounted? _____

d. The single-point mounted diamond held in overhead-type dresser dresses the grinding wheel to what shape? _____

e. What is the hand-held dressing stick used for? _____ _____

f. What is a brake-controlled dressing and truing device used for? _____ _____ _____

g. What is the diamond-plate dressing block used for? _____ _____ _____

h. What is the advantage of the sine dresser (angle dresser)? _____ _____

i. Where is the sine dresser (angle dresser) mounted? _____

_____

j. How may the dressing of wheel be done with a sine dresser (angle dresser)? _____

k. What abrasive does the radius dresser use? _____

l. What is the radius dresser used for? _____

_____

m. What is the radius and tangent dresser used for? _____

_____

_____

n. How does the pantograph or template-type dresser work? _____

_____

_____

o. Where is the roll dresser mounted? _____

p. Is the roll dresser used for rough dress grinding or fine dress grinding? _____

3. Fill in the blanks to complete the following statements about parts of a radius and tangent dresser and their uses.

Movement	Shape	Ring rotation
Lock	Amount of radius	Diamond and micrometer plate
Horizontal movement	Straight line	Radius limits
Upright	180 degrees	Micrometer pins
Swivel-base slide	Swivel ring	Supports
Calibrates	Angle traverse control handle	

a. MICROMETER PLATE--_____ diamond to swivel base

b. SWIVEL RING--Rotates on swivel base to set _____

_____

c. FIXED STOP--Stops rotation of _____ by making contact with swivel-ring stop pins

d. DIAMOND--Cuts wheel to _____

e. TRAVERSE LOCK--Prevents movement of _____

_____

f. SWIVEL-BASE SLIDE--Supports swivel base; allows _____

_____ of swivel base

g. SWIVEL-RING LOCKING SCREW--Allows swivel ring to be set to generate a radius up to _____

h. ANGLE TRAVERSE CONTROL HANDLE--Moves diamond in a _____

_____ at angle desired

i. GIB TENSION SCREWS--_____ swivel-base slide in base

j. MICROMETER BASE LEAD-SCREW KNOB--Moves _____

_____ with micrometer accuracy; calibrated in 0.001-inch increments

k. SWIVEL BASE--Used with _____ to set amount of radius

l. VERNIER PLATE--Indicates amount of _____ of swivel ring

m. SLIDE LOCK--Locks slide in place at setting of _____

_____

n. BASE--_____ swivel-base slide and upright

o. UPRIGHT--Supports _____

_____

p. SWIVEL-RING STOP PINS--Stop swivel-base and _____

_____ at setting of fixed stop

q. MICROMETER PINS--Set _____

4. Fill in the blanks to complete probable causes of surface grinding problems.

BURNING OR CHECKING

a. Wheel not dressed or _____ dressed

b. Wheel too _____

c. Wheel too _____

d. Coolant _____

e. Feed _____

f. Depth of cut _____

CHATTER

a. Wheel too _____

b. Wheel too _____

c. Wheel out of _____

d. Wheel out of _____

e. Internal machine _____

f. External machine _____

g. Spindle bearings _____

SCRATCHES

a. Wheel dressing _____

b. Wheel too _____

c. Wheel too _____

d. Coolant _____

e. Chuck dirty or _____

f. Loose dirt under _____

g. Workpiece not _____

39

CONCAVE OR CONVEX AREAS ON WORKPIECE

a. Wheel dressing _____

b. Wheel too _____

c. Coolant _____ improperly

d. Chuck _____ or burred

e. Table feed too _____

f. Heat-treatment _____

g. Workpiece too _____

5. List the problems that could occur as a result of the following conditions.

a. Workpiece too thin--_____

b. Wheel too soft--_____

c. Excessive feed--_____

d. Internal or external machine vibrations--_____

e. Loose dirt under guard--_____

f. Wheel too hard--_____

g. Spindle bearings bad--_____

h. Workpiece not held securely--_____

i. Wheel out of balance or out of round--_____

j. Coolant dirty--_____

6. Fill in the blanks to complete the following safety rules for working with a magnetic chuck.

a. Clean _____ surface of chuck before placing anything on chuck

b. When deburring, rub top surface of chuck with a hard, fine oilstone to remove _____

c. Carefully place workpiece on chuck to avoid nicking, burring, or scratching the chucking surface; never chuck workpiece that has _____

d. Use _____ between workpiece and chuck surface

e. If possible, touch _____ magnetized strips to workpiece for sufficient holding power

f. Block small parts with _____ or _____ to prevent work from slipping

g. Never wear _____ while using magnetic chuck

h. Before grinding always check _____ to make sure that workpiece is firmly held

i. Wear approved _____ protection when operating grinder

j. On connetic V-blocks and parallels, position laminated setup tools with laminations parallel to _____ of magnetic chuck so that holding power is transferred to workpiece

k. With magna-vise clamps, check _____ to ensure that it is held securely

l. Remove _____ plates before resurfacing magnetic chuck

m. When resurfacing, always regrind chuck surface with chuck energized, using cuts of no more than _____ inch per pass

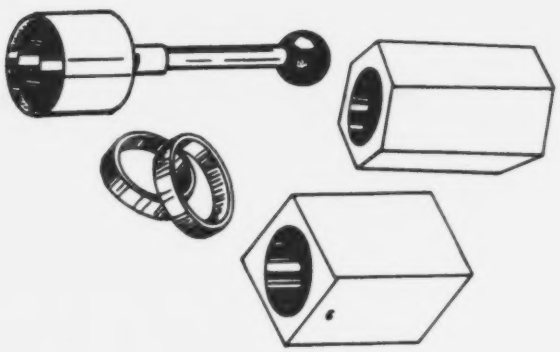
7. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 7. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Learning Step 7.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

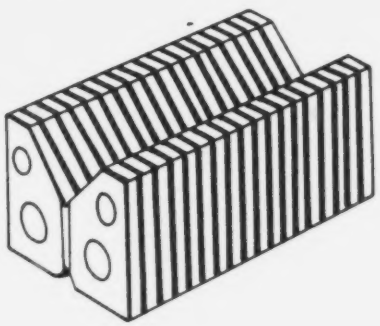
LAP ASSIGNMENT SHEET #3

NAME_____ SCORE_____

1. Identify the work-holding devices illustrated below. Write the correct names in the blanks.



a. _____



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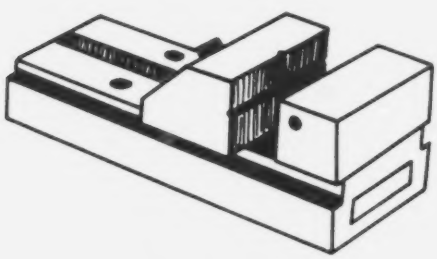
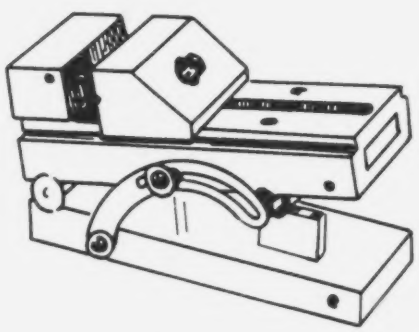
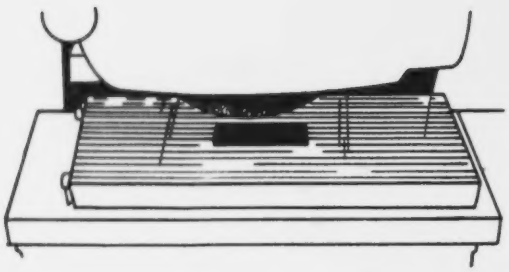


c. _____

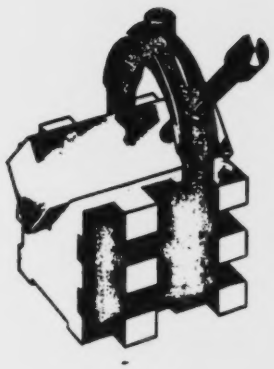


d. _____

LAP ASSIGNMENT SHEET #3



e. _____



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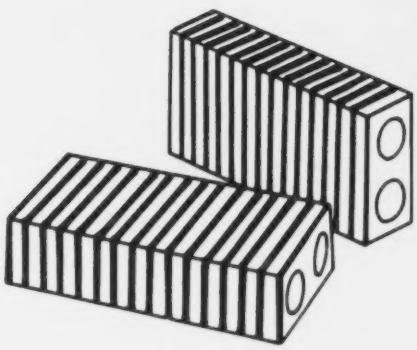
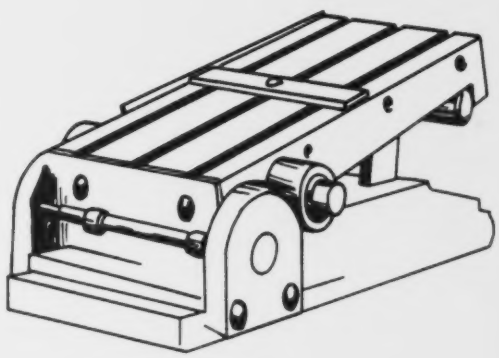
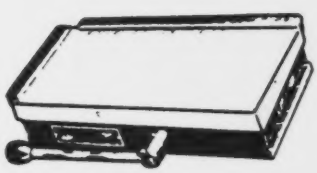


g. _____

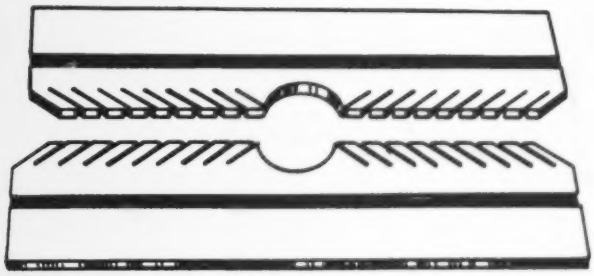


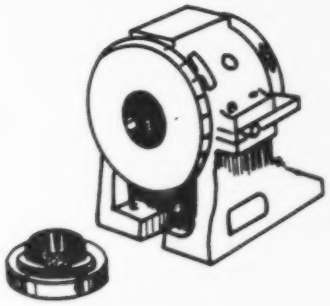
h. _____



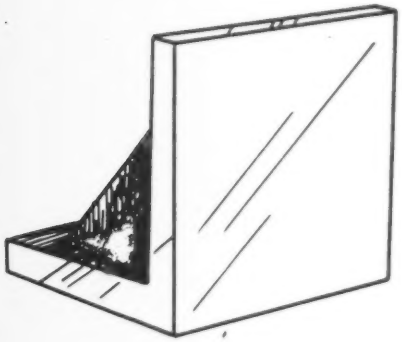
i. _____

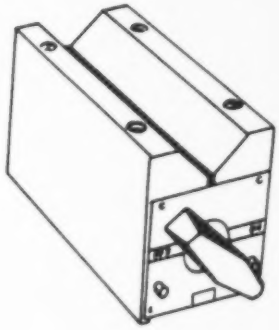
LAP ASSIGNMENT SHEET #3



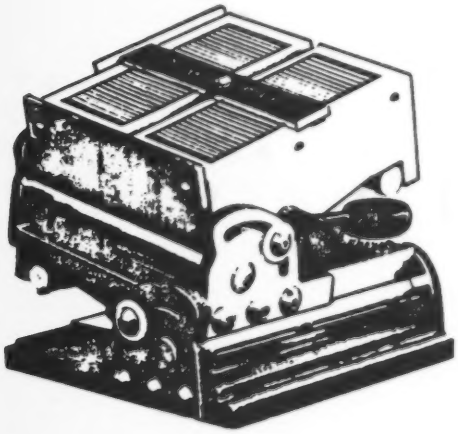


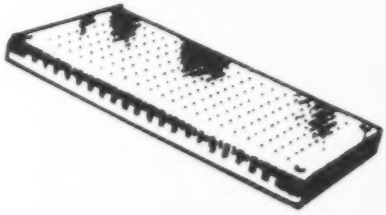
j. _____ k. _____





l. _____ m. _____





n. _____ o. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 12. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Learning Step 12.

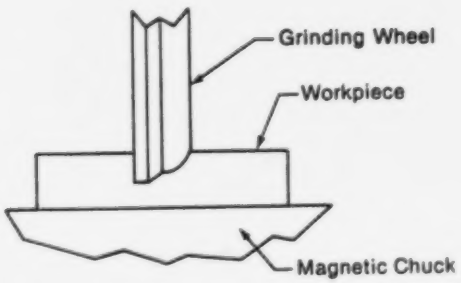
MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #4

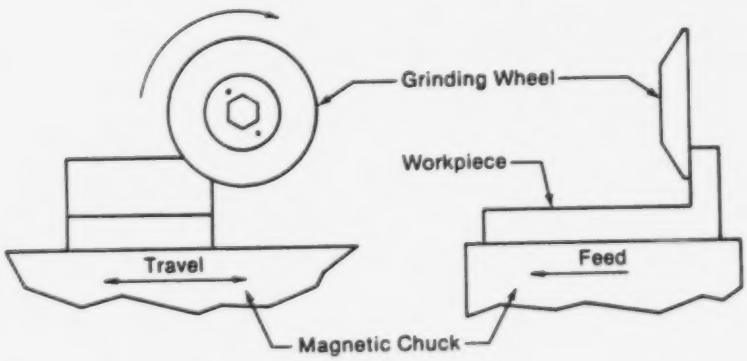
NAME_____ SCORE_____

1. Identify surface grinding operations illustrated below. Write the correct grinding operations in the blanks. Some answers may be used more than once; some blanks may contain more than one answer.

Grinding edges
Form or profile grinding
Grinding angular surfaces
Cutting off
Grinding flat surfaces
Grinding vertical surfaces
Grinding grooves or slots

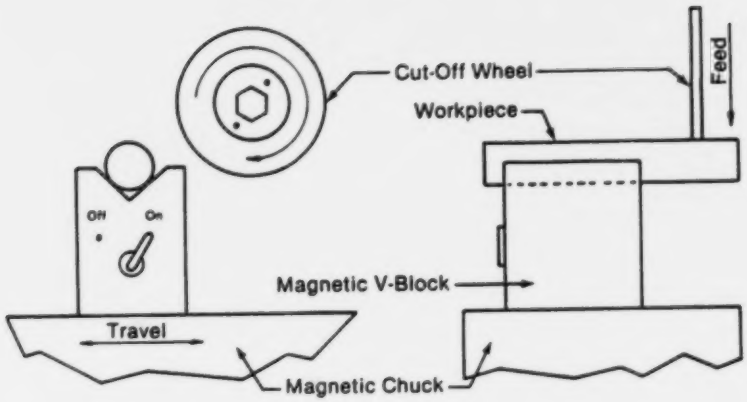


a. _____

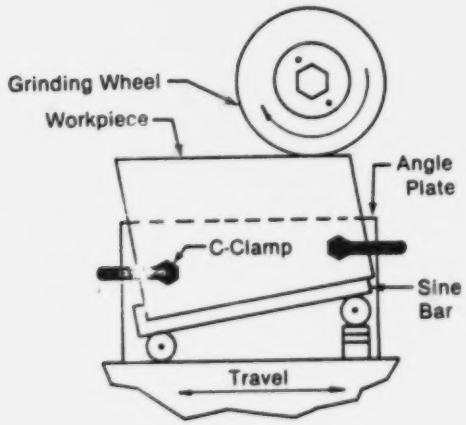


b. _____

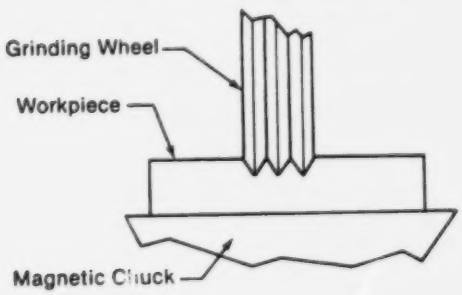
LAP ASSIGNMENT SHEET #4



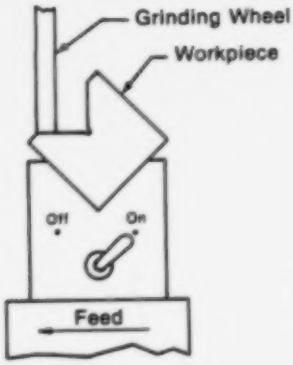
c. _____



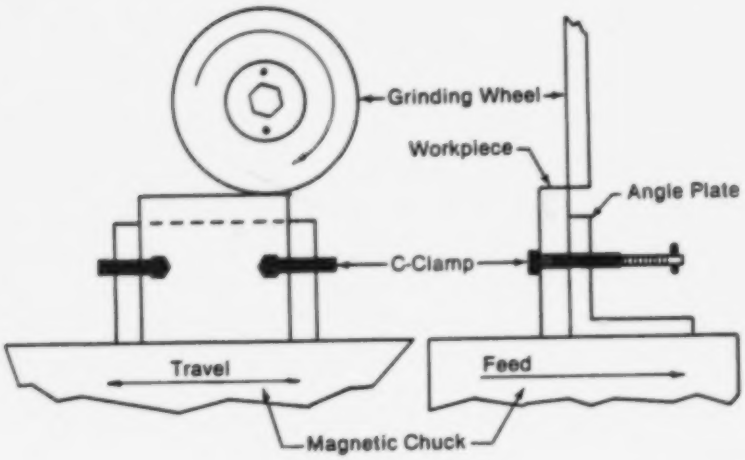
d. _____



e. _____


Grinding Wheel
Workpiece
Off
On
Feed

f. _____

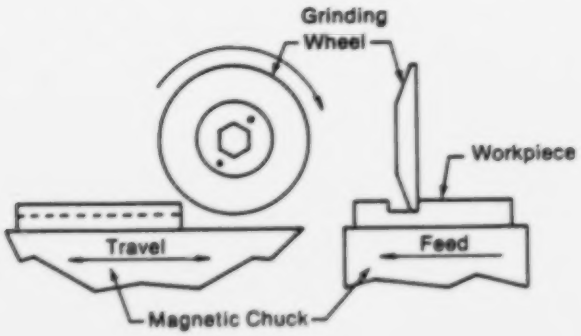

Grinding Wheel
Workpiece
Angle Plate
C-Clamp
Travel
Feed
Magnetic Chuck

g. _____

Grinding Wheel
Workpiece

h. _____

LAP ASSIGNMENT SHEET #4



i. _____

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 15. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Learning Step 15.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #5

NAME_____ SCORE_____

1. Identify types of grinding wheels used for specific surface grinding operations. Write the correct type number(s) in the blanks. Some blanks may contain more than one answer. Answers may be used more than once.

_____a. Grinding angular surfaces

_____b. Grinding vertical surfaces

_____c. Grinding flat surfaces

_____d. Grinding grooves or slots

_____e. Form grinding

_____f. Grinding edges

_____g. Cutting off

Type #1 (straight wheel)

Type #5 (recessed one side)

Type #12 (dish)

2. List specific grinding operations that can be performed with each type of grinding wheel.

TYPE #1 (STRAIGHT WHEEL)

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

TYPE #5 (RECESSED ONE SIDE)

a. _____

b. _____

c. _____

d. _____

LAP ASSIGNMENT SHEET #5

TYPE #12 (DISH)

a. _____

b. _____

c. _____

3. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 18. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instruccor's satisfaction, continue to Learning Step 18.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #6

NAME_____ SCORE_____

1. Match proper grinding-wheel compositions to the different materials for which they are used. Write the correct numbers in the blanks. Some blanks may contain more than one answer. Some answers may be used more than once.

_____a.	Carbide	1. Cubic boron nitride with resinoid bond
_____b.	Soft steel	2. Silicon carbide with vitrified bond
_____c.	Hardened steel	3. Aluminum oxide with vitrified bond
_____d.	Cast iron (soft), bronze, and aluminum	4. Diamond with metal bond
_____e.	High speed steel	

2. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 21. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Learning Step 21.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

LAP ASSIGNMENT SHEET #7

NAME_____ SCORE_____

1. Name the types of grinding wheel(s) used for each of the following surface grinding operations. Blanks may contain more than one answer.

   a. Grinding flat surfaces--_____

   b. Grinding angular surfaces--_____

   c. Grinding vertical surfaces--_____

   d. Grinding edges--_____

   e. Form grinding--_____

   f. Grinding grooves or slots--_____

2. Name the grinding wheel composition required for each of the following materials.

   a. Silicon carbide with vitrified bond--_____

   _____

   b. Aluminum oxide with vitrified bond, or cubic boron nitride with resinoid bond--_____

   c. Silicon carbide with vitrified bond, or diamond with metal bond--_____

   _____

   d. Aluminum oxide with vitrified bond--_____

   _____

3. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to Learning Step 24. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Learning Step 24.

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO PRETEST

1.	a.	3	f.	11	k.	6
	b.	5	g.	10	l.	1
	c.	14	h.	7	m.	8
	d.	9	i.	2	n.	13
	e.	12	j.	4		

2. a. Grinding grooves or slots, grinding vertical surfaces
   b. Grinding angular surfaces, form or profile grinding
   c. Form or profile grinding
   d. Form or profile grinding
   e. Grinding edges
   f. Grinding angular surfaces, grinding flat surfaces
   g. Grinding vertical surfaces
   h. Grinding angular surfaces
   i. Cutting off
   j. Grinding flat surfaces

3. a. #1, #5
   b. #1, #12
   c. #1, #5
   d. #1, #5
   e. #1, #5, #12
   f. #12

ANSWERS TO PRETEST

4. a. 1
   b. 3, 4
   c. 1
   d. 4
   e. 1, 2

5. a. 4
   b. 3
   c. 1
   d. 2
   e. 6
   f. 9
   g. 7
   h. 10
   i. 8
   j. 5

6. a. Magnetic chucks
   b. Angle plate
   c. Adapter plate
   d. Compound sine chuck
   e. Connetic parallels
   f. Collet block chucks
   g. Magnetic V-block
   h. Adjustable angle plate
   i. V-block and clamp
   j. Vacuum chuck
   k. Indexing collet fixture
   l. Magna-vise clamps
   m. Connetic V-block
   n. Sine vise
   o. Vise (precision)

ANSWERS TO PRETEST

7.

a.	6	g.	4	m.	10
b.	13	h.	15	n.	11
c.	12	i.	17	o.	16
d.	7	j.	8	p.	1
e.	5	k.	9	q.	2
f.	14	l.	3		

8. BURNING OR CHECKING (Answer should include any four of the following)

a. Wheel not dressed or improperly dressed

b. Wheel too hard

c. Excessive feed

d. Excessive depth of cut

e. Wheel too fine

f. Coolant applied improperly

CHATTER (Answer should include any four of the following)

a. Wheel too hard

b. Wheel out of balance

c. Internal machine vibrations

d. Spindle bearings bad

e. Wheel too soft

f. Wheel out of round

g. External machine vibrations

SCRATCHES (Answer should include any four of the following)

a. Coolant dirty

b. Loose dirt under guard

c. Wheel too coarse

d. Wheel not dressed or improperly dressed

e. Chuck dirty or burred

f. Wheel too soft

g. Workpiece not held securely

CONCAVE OR CONVEX AREAS ON WORKPIECE (Answer should include any four of the following)

a. Wheel too hard

b. Wheel not dressed or improperly dressed

c. Table feed too slow

d. Workpiece too thin

e. Chuck dirty or burred

f. Coolant applied improperly

g. Heat-treatment stress

9. a. Clean top surface of chuck before placing anything on chuck

b. Rub top surface of chuck with a hard, fine oilstone to remove nicks and burrs

c. Carefully place workpiece on chuck to avoid nicking, burring, or scratching the chucking surface; never chuck workpiece that has burrs

d. Use thin grinding paper between workpiece and chuck surface

e. If possible, touch three magnetized strips to workpiece for sufficient holding power

f. Block small parts with steel bars or parallels to prevent work from slipping

g. Never wear jewelry while using magnetic chuck

h. Before grinding, always check setup to make sure that workpiece is firmly held

i. Wear approved eye protection when operating grinder

j. Position laminated setup tools with laminations parallel to inner poles of magnetic chuck so that holding power is transferred to workpiece

ANSWERS TO PRETEST

k. Check workpiece to ensure that it is held securely in magna-vise clamps

l. Remove side and end plates before resurfacing magnetic chuck

m. When resurfacing, always regrind chuck surface with chuck energized, using cuts of no more than 0.001 inch per pass

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #1

1.	a.	1	h.	4	
	b.	14	i.	10	
	c.	7	j.	13	
	d.	11	k.	5	
	e.	6	l.	12	
	f.	8	m.	3	
	g.	9	n.	2	
2.	a.	1	f.	2	
	b.	5	g.	4	
	c.	7	h.	8	
	d.	10	i.	6	
	e.	3	j.	9	
3.	a.	6	g.	12	m. 11
	b.	5	h.	10	n. 15
	c.	13	i.	16	o. 4
	d.	2	j.	7	p. 17
	e.	1	k.	14	q. 3
	f.	9	l.	8	

ANSWERS TO LAP ASSIGNMENT SHEET #1

4.

	Chatter	Burning or Checking	Scratches	Concave or Convex Areas on Workpiece
a.		X		
b.		X		
c.	X			
d.	X			
e.				X
f.		X	X	X
g.	X			
h.	X			
i.			X	
j.		X		
k.	X		X	
l.	X	X		X
m.			X	
n.			X	
o.				X
p.	X			
q.			X	
r.		X		X
s.				X
t.			X	X

5. a. Cleaning--Clean top surface of chuck before placing anything on chuck

ANSWERS TO LAP ASSIGNMENT SHEET #1

b. Deburring--Rub top surface of chuck with a hard, fine oilstone to remove nicks and burrs

c. Workpiece--Carefully place workpiece on chuck to avoid nicking, burring, or scratching the chucking surface; never chuck workpiece that has burrs

d. Paper--Use thin grinding paper between workpiece and chuck surface

e. Magnetized strips--If possible, touch three magnetized strips to workpiece for sufficient holding power

f. Small parts--Block small parts with steel bars or parallels to prevent work from slipping

g. Jewelry--Never wear jewelry while using magnetic chuck

h. Setup--Before grinding, always check setup to make sure that workpiece is firmly held

i. Eyes--Wear approved eye protection when operating grinder

j. Connetic V-blocks and parallels--Position laminated setup tools with laminations parallel to inner poles of magnetic chuck so that holding power is transferred to workpiece

k. Magna-vise clamps--Check workpiece to ensure that it is held securely

l. Side and end plates--Remove before resurfacing magnetic chuck

m. Resurfacing--Always regrind chuck surface with chuck energized, using cuts of no more than 0.001 inch per pass

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #2

1. a. Inward
   b. Back to front
   c. Power
   d. Difficulty
   e. Horizontal
   f. Alternately
   g. Smoothness
   h. Outward
   i. Burrs
   j. Impurities
   k. Scratches
   l. Strain
   m. Warps or bows
   n. Shape; cutting particles

2. a. Directly to magnetic chuck
   b. Flat
   c. To wheel guard
   d. Flat
   e. To remove ragged edges from grinding wheel; for rough forming or shaping
   f. Dressing and truing grinding wheel; can be used to true diamond wheels when used with proper dressing stone
   g. For form or contour dressing; can dress wheel during grinding operation

h. Can shape wheel to desired angle

i. To magnetic chuck

j. Mechanically or by hand

k. Diamond

l. To generate a set radius for concave or convex surface

m. Generating angles, radii, or a combination of angle and radius

n. A mechanical finger follows a template and generates the shape of the template

o. To chuck or table

p. Rough dress grinding

3. a. Calibrates

b. Amount of radius

c. Upright

d. Shape

e. Angle traverse control handle

f. Horizontal movement

g. 180 degrees

h. Straight line

i. Lock

j. Swivel-base slide

k. Swivel ring

l. Movement

m. Micrometer pins

n. Supports

o. Diamond and micrometer plate

p. Ring rotation

q. Radius limits

ANSWERS TO LAP ASSIGNMENT SHEET #2

4. BURNING OR CHECKING

   a. Improperly

   b. Fine

   c. Hard

   d. Applied improperly

   e. Excessive

   f. Excessive

   CHATTER

   a. Hard

   b. Soft

   c. Balance

   d. Round

   e. Vibrations

   f. Vibrations

   g. Bad

   SCRATCHES

   a. Not dressed or improperly dressed

   b. Soft

   c. Coarse

   d. Dirty

   e. Burred

   f. Guard

   g. Held securely

   CONCAVE OR CONVEX AREAS ON WORKPIECE

   a. Not dressed or improperly dressed

   b. Hard

c. Applied

d. Dirty

e. Slow

f. Stress

g. Thin

5. a. Concave or convex areas on workpiece

b. Chatter, scratches

c. Burning or checking

d. Chatter

e. Scratches

f. Burning or checking, chatter, concave or convex areas on workpiece

g. Chatter

h. Scratches

i. Chatter

j. Scratches

6. a. Top

b. Nicks and burrs

c. Burrs

d. Thin grinding paper

e. Three

f. Steel bars, parallels

g. Jewelry

h. Setup

i. Eye

j. Inner poles

ANSWERS TO LAP ASSIGNMENT SHEET #2

k. Workpiece

l. Side and end

m. 0.001

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #3

1. a. Collet block chucks
   b. Connetic V-block
   c. Vise (precision)
   d. Sine vise
   e. Adapter plate
   f. V-block and clamp
   g. Connetic parallels
   h. Adjustable angle plate
   i. Magnetic chucks
   j. Magna-vise clamps
   k. Indexing collet fixture
   l. Angle plate
   m. Magnetic V-block
   n. Compound sine chuck
   o. Vacuum chuck

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #4

1. a. Form or profile grinding
   b. Grinding vertical surfaces
   c. Cutting off
   d. Grinding angular surfaces
   e. Form or profile grinding
   f. Grinding angular surfaces, grinding flat surfaces
   g. Grinding edges
   h. Grinding angular surfaces, form or profile grinding
   i. Grinding vertical surfaces, grinding grooves or slots

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #5

1. a. #1, #5

   b. #12

   c. #1, #5, #12

   d. #1, #12

   e. #1, #5

   f. #1, #5

   g. #1

2. TYPE #1 (STRAIGHT WHEEL)

   a. Grinding flat surfaces

   b. Grinding edges

   c. Cutting off

   d. Grinding grooves or slots

   e. Grinding angular surfaces

   f. Form grinding

   TYPE #5 (RECESSED ONE SIDE)

   a. Grinding flat surfaces

   b. Grinding edges

   c. Grinding angular surfaces

   d. Form grinding

   TYPE #12 (DISH)

   a. Grinding flat surfaces

   b. Grinding vertical surfaces

   c. Grinding grooves or slots

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #6

1. a. 2, 4

   b. 3

   c. 3

   d. 2

   e. 1, 3

MACHINE SHOP GRINDING MACHINES
UNIT II--SURFACE GRINDING

ANSWERS TO LAP ASSIGNMENT SHEET #7

1. a. Type #1, type #5, type #12
   b. Type #1, type #5
   c. Type #12
   d. Type #1, type #5
   e. Type #1, type #5
   f. Type #1, type #12

2. a. Cast iron (soft), bronze, aluminum
   b. High speed steel
   c. Carbide
   d. Hardened steel, soft steel